Docket No.: H0610.0023/P023
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Per Zeuthen, et al.

Application No.: 09/768,733 | Confirmation No.: 1229

Filed: January 24, 2001 | Art Unit: 1764

For: PROCESS FOR REDUCING CONTENT OF SULPHUR COMPOUNDS AND POLY-AROMATIC HYDROCARBONS IN A HYDROCARBON FEED | Examiner: W. D. Griffin

APPELLANTS' BRIEF ON APPEAL

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This is an appeal pursuant to 35 U.S.C. § 134 and 37 C.F.R. §§ 1.191 et seq. from the final rejection of claims 1-8 of the above-identified application mailed April 18 18, 2003. The fee for submitting this Brief ($330.00, 37 C.F.R. § 1.17(c)) is attached. Any deficiency in the fees associated with this Brief should be charged to our Deposit Account No. 04-1073. The Notice of Appeal was filed on August 13, 2003. Enclosed are an original and two copies of this brief with appended claims.

This brief contains items under the following headings as required by 37 C.F.R. § 1.192 and M.P.E.P. § 1206:

I. Real Party In Interest
II Related Appeals and Interferences
III. Status of Claims
IV. Status of Amendments
V. Summary of Invention

I. REAL PARTY IN INTEREST

The real party in interest for this appeal is HALDOR TOPSOE A/S, a corporation of Denmark, the assignee of this application.

II. RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences known to Appellants, their legal representative, or the assignee that will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 8 claims pending in this application.

Claims 1, 3 and 5-8 are rejected under 35 U.S.C. § 102 as being anticipated by Kelley et al. (U.S. Patent No. 4,040,944).

Claim 2 is rejected under 35 U.S.C. § 103 as being unpatentable over Kelley et al. (U.S. Patent No. 4,040,944).

Claim 4 is rejected under 35 U.S.C. § 103 as being unpatentable over Kelley et al. (U.S. Patent No. 4,040,944) in view of Inwood (U.S. Patent No. 3,691,060).

B. Current Status of Claims

1. Claims canceled: 0

2. Claims withdrawn from consideration but not canceled: 0

3. Claims pending: 8

4. Claims allowed: 0

5. Claims rejected: 8

C. Claims On Appeal

There are 8 claims on appeal.

IV. STATUS OF AMENDMENTS

Appellants filed an Amendment After Final Rejection on July 18, 2003. The Examiner responded to the Amendment After Final Rejection in an Advisory Action dated August 1, 2003. Subsequent to the August 1, 2003 Advisory Action, Appellants filed a Response After Final Action and a Notice of Appeal on August 13, 2003. An Advisory Action was mailed on September 4, 2003 and another Amendment After Final Action was subsequently filed on October 10, 2003. In an Advisory Action dated October 28, 2003, Examiner Griffin indicated that Appellants' proposed amendment to claim 1 will be entered. Accordingly, the claims enclosed as Appendix A incorporate the last amendments to claims 1-8, as indicated in the Amendment After Final Action filed on October 10, 2003. There have been no amendments subsequent to the October 28, 2003 Advisory Action.

V. SUMMARY OF INVENTION

The present invention relates to a process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock. A feed stock is mixed with hydrogen and passed through a hydrotreating reactor over a hydrotreating

catalyst under conditions that are effective for hydrotreating and obtaining a hydrotreated effluent. The effluent from the hydrotreating reactor is cooled to a suitable temperature by heat exchange with the feed. The cooled hydrotreated effluent is subsequently contacted with a hydrotreating catalyst at conditions that are effective for the hydrogenation of the polyaromatic hydrocarbons and, therefore, for the conversion of the polyaromatic hydrocarbons to monoaromatic compounds. The hydrotreated effluent including the monoaromatic compounds is then introduced into a fuel catalytic cracking (FCC) unit for producing gasoline.

VI. ISSUES

Whether the rejection of claims 1, 3 and 5-8 as being anticipated by Kelley et al. (U.S. Patent No. 4,040,944) should be reversed.

Whether the rejection of claim 2 as being unpatentable over Kelley et al. (U.S. Patent No. 4,040,944) should be reversed.

Whether the rejection of claim 4 as being unpatentable over Kelley et al. (U.S. Patent No. 4,040,944) in view of Inwood (U.S. Patent No. 3,691,060) should be reversed.

VII. GROUPING OF CLAIMS

For this Appeal Brief only, and without conceding the teachings of any prior art reference, claims 1-8 stand or fall together.

VIII. ARGUMENTS

A. CLAIMS 1, 3 AND 5-8 ARE NOT PROPERLY REJECTED UNDER 35 U.S.C. § 102 AS BEING ANTICIPATED BY KELLEY ET AL. (U.S. PATENT N0. 4,040,944)

Claims 1, 3 and 5-8 are rejected under 35 U.S.C. § 102 as being anticipated by Kelley et al. (U.S. Patent No. 4,040,944) ("Kelley"). This rejection is respectfully traversed.

Independent claim 1 recites a "process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock" by *inter alia* "contacting the feed stock with hydrogen over a hydrotreating catalyst at conditions being effective for hydrotreating and obtaining a hydrotreated effluent" and "cooling the hydrotreated effluent." Independent claim 1 also recites "contacting the cooled hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds" and "introducing the hydrotreated effluent from step (c) into an FCC unit for producing gasoline."

Dependent claim 3 recites that the "LHSV in step (c) is between 2 and 20 times the LHSV in step (a)." Dependent claim 5 recites that "the feedstock is characterized by having a 50% boiling point between 300°C and 450°C." Dependent claim 6 recites that "the hydrotreating catalyst used in step (c) is a composite of Group VI-B and/or Group VIII metal on a porous refractory inorganic oxide." Claims 7 and 8 dependent on claim 6 and recite that "the metals are nickel and molybdenum or nickel and tungsten" and that "the porous refractory inorganic oxide is alumina or silica-alumina," respectively.

Kelley relates to a method of manufacturing catalytic cracking charge stocks by hydrocracking. According to Kelley, charge stock containing a relatively large proportion of heavy hydrocarbons boiling above about 800° F is produced by first subjecting a raw feedstock boiling predominantly above 600° F and containing a substantial proportion of material boiling above 800° F to catalytic hydrofining followed by catalytic hydrocracking at high pressures. (Abstract). Kelley teaches that the hydrocracking catalyst and conditions

"are chosen so as to achieve selective conversion of material boiling between about 600° F and 800° F to lower boiling materials with a relatively minor conversion of the 800° F + material." (Abstract). In this manner, "[t]he resulting product boiling above 400° F is rich in 800° F + material, and constitutes an excellent catalytic cracking charge stock." (Abstract).

Kelley does not disclose all limitations of claims 1, 3 and 5-8. Kelley fails to teach or suggest a "process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock" by *inter alia* "contacting the feed stock with hydrogen over a hydrotreating catalyst at conditions being effective for hydrotreating and obtaining a hydrotreated effluent" and "*cooling the hydrotreated effluent*," as independent claim 1 recites (emphasis added). Kelley teaches a dual-step process of subjecting a raw feedstock boiling predominantly above 600° F and containing a material boiling above 800° F to catalytic hydrofining followed by catalytic hydrocracking at high pressures. Kelley is silent, however, about "*cooling the hydrotreated effluent*" subsequent to "contacting the feed stock with hydrogen . . . for hydrotreating and obtaining a hydrotreated effluent" and before "contacting the cooled hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds," as independent claim 1 recites (emphasis added).

Appellants disagree with the Examiner's position that the statement in Kelley that the hydrocracker is "operated at substantially reduced temperatures" meets the steps of "cooling the hydrotreated effluent" and "contacting the cooled hydrotreated effluent with a hydrotreating catalyst" of the claimed invention. First, the term "operated at substantially reduced temperatures" simply denotes that the hydrocracker 12 may be operated at lower temperatures, as part of the "[m]any variations in the . . . processing scheme" contemplated by Kelley. (Col. 6, lines 25-36). The term "operated at substantially reduced temperatures" of Kelley does not disclose or suggest the active steps of "cooling the hydrotreated effluent" and "contacting the cooled hydrotreated effluent

with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds," as specifically recited in independent claim 1 of the present application. In Kelley, there is no mention about "cooling the hydrotreated effluent," much less about "contacting the *cooled* hydrotreated effluent with a hydrotreating catalyst," as in the claimed invention (emphasis added).

Second, Kelley specifically teaches against the intermediate cooling step. Kelley emphasizes that "total effluent from hydrofiner 10 is transferred to hydrocracker 12 via line 14, *without intervening cooling*, condensation or separation of ammonia and hydrogen sulfide generated in the hydrofiner." (Col. 4, lines 26-30; emphasis added). In fact, in exemplifying the first step of manufacturing its catalytic cracking charge stocks, Kelley lists both the temperatures of the hydrofining and hydrocracking steps as constant, that is, a "broad range" of 650-875°F and a "preferred range" of 725-850°F. (Col. 4, lines 8-10; lines 38-40). Thus, it is clear that no intervening cooling step occurs between the hydrofining and hydrocracking steps of Kelley.

Third, the Examiner's assertion that "[o]ne of ordinary skill in the art reading these two sections [of Kelley] would realize that an intervening cooling step can be applied" is wrong.[1] (August 1, 2003 Advisory Action at 2; October 28, 2003 Advisory Action at 2). As noted above, Kelley teaches a constant temperature range of 650-875°F for its hydrofining and hydrocracking steps. This is because, in outlining the problems of the prior art non-hydrogenative catalytic cracking systems, Kelley specifically notes that

[1] In the Advisory Actions dated September 4, 2003 and October 28, 2003, the Examiner notes that "Kelly discloses that the process can be operated without intervening cooling, condensation, or separation of ammonia and hydrogen sulfide." (September 4, 2003 Advisory Action at 2; October 28, 2003 Advisory Action at 2). The Examiner also asserts that "Kelley also discloses that an intervening treatment of the hydrofiner effluent can be performed to remove ammonia and hydrogen sulfide." (September 4, 2003 Advisory Action at 2; October 28, 2003 Advisory Action at 2). The Examiner then concludes that "[o]ne of ordinary skill in the art reading these two sections would realize that an intervening cooling step can be applied" and that "the disclosure that the hydrocracker can be operated at substantially reduced temperatures indicates that cooling can be

"[i]f a feedstock boils over a wide range of say 400° to 1000°F, it is difficult to select a cracking temperature which is optimum for all hydrocarbon fractions in the feed." (Col. 1, lines 24-27). For example, "[i]f high cracking temperatures are utilized in order to maintain adequate conversion of the lower boiling fractions, the higher boiling fractions then tend to produce inordinate amounts of coke and light gases." (Col. 1, lines 27-31). Similarly, "if low temperatures are employed . . . then conversion of the lower boiling fractions is reduced, resulting in low overall conversions per pass and high recycle rates." (Col. 1, lines 31-35). Accordingly, one skilled in the art would not have been motivated to modify the temperature of the hydrocracker of Kelley or to operate the hydrocracker of Kelley at substantially lower temperatures, as the Examiner asserts.

Appellants note that courts have repeatedly emphasized that anticipation is established only if (1) all the elements of an invention as stated in a patent claim (2) are identically set forth (3) in a single prior art reference.[2] Thus, the standard for anticipation or lack of novelty is strict identity. See, e.g., Novo Nordisk A/S v. Becton Dickinson & Co., 96 F. Supp. 2d 309, 312 (S.D.N.Y. 2000) ("It is not sufficient that each element be found somewhere in the reference, the elements must be 'arranged as in the claim.' *Lindemann Maschinenfabrik GMBH v. American Hoist and Derrick Co.*, 703 F.2d 1452, 1458 (Fed. Cir. 1984). Further, the reference must be sufficiently clear so as to prove the existence of each and every element in the reference."); Verve, LLC v. Crane Cams, Inc., 311 F.3d 1116, 1120 (Fed. Cir. 2002) ("A single reference must describe the claimed invention with sufficient precision and detail to establish that the subject matter existed in

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performed." (September 4, 2003 Advisory Action at 2; October 28, 2003 Advisory Action at 2).

[2] See, e.g., Gechter v. Davidson, 116 F.3d 1454, 1457 (Fed. Cir. 1997) ("Under 35 U.S.C. § 102, every limitation of a claim must identically appear in a single prior art reference for it to anticipate the claim."); Glaverbel Societe Anonyme v. Northlake Marketing & Supply, Inc., 45 F.3d 1550, 1554 (Fed. Cir. 1995) ("Anticipation requires identity of the claimed process and a process of the prior art; the claimed process, including each step thereof, must have been described or embodied, either expressly or inherently, in a single reference."; "Anticipation . . . requires identity of invention: the claimed invention, as described in appropriately construed claims, must be the same as that of the reference, in order to anticipate.").

the prior art."); C.R. Bard, Inc. v. M3 Systems, Inc., 157 F.3d 1340, 1349 (Fed. Cir. 1998), *rehearing denied & suggestion for rehearing in banc declined*, 161 F.3d 1380 (Fed. Cir. 1998), *cert denied*, 526 U.S. 1130 (1999) ("When the defense of lack of novelty is based on a printed publication that is asserted to describe the same invention, a finding of anticipation requires that the publication describe all of the elements of the claims, arranged as in the patented device."); Hazani v. U.S. Int'l Trade Comm'n, 126 F.3d 1473, 1477 (Fed. Cir. 1997) ("To anticipate a claim, a prior art reference must disclose every feature of the claimed invention, either explicitly or inherently.").

In the present case, and as the case law requires, Kelley must disclose every feature of the claimed invention. Kelley, however, does not disclose or suggest the active step of "cooling the hydrotreated effluent," as specifically recited in independent claim 1 of the present application. The term "operated at substantially reduced temperatures" of Kelley simply denotes that the hydrocracker 12 may be operated at lower temperatures, as part of the "[m]any variations in the . . . processing scheme" contemplated by Kelley (Kelley at col. 6, lines 25-36); the term "operated at substantially reduced temperatures" of Kelley does not disclose or suggest the active step of "cooling the hydrotreated effluent," as in the claimed invention. Accordingly, Kelley fails to disclose all process steps of claims 1, 3 and 5-8, arranged in the recited order, and reversal of the rejection of claims 1, 3 and 5-8 is respectfully requested.

B. CLAIM 2 IS PATENTABLE OVER KELLEY ET AL. (U.S. PATENT NO. 4,040,944)

As noted above, independent claim 1 recites a "process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock" by *inter alia* "contacting the feed stock with hydrogen over a hydrotreating catalyst at conditions being effective for hydrotreating and obtaining a hydrotreated effluent" and "cooling the hydrotreated effluent." Independent claim 1 also recites "contacting the cooled hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds" and "introducing

the hydrotreated effluent from step (c) into an FCC unit for producing gasoline." Claim 2 depends on independent claim 1 and recites that "the temperature in step (c) is between 50°C and 150°C lower than outlet temperature from step (a)."

Kelley does not teach or suggest all limitations of dependent claim 2. Specifically, the Examiner fails to establish a *prima facie* case of obviousness. Appellants note that courts have generally recognized that a showing of a *prima facie* case of obviousness necessitates three requirements: (i) some suggestion or motivation, either in the references themselves or in the knowledge of a person of ordinary skill in the art, to modify the reference or combine the reference teachings; (ii) a reasonable expectation of success; and (iii) the prior art references must teach or suggest all claim limitations. See e.g., In re Dembiczak, 175 F.3d 994 (Fed. Cir. 1999); In re Rouffet, 149 F.3d 1350, 1355 (Fed. Cir. 1998); Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc., 75 F.3d 1568, 1573 (Fed. Cir. 1996).

In the present case, Kelley fails to teach or suggest all limitations of independent claim 1 and of dependent claim 2. As noted above, Kelley fails to teach or suggest a "process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock" by *inter alia* "contacting the feed stock with hydrogen over a hydrotreating catalyst at conditions being effective for hydrotreating and obtaining a hydrotreated effluent" and "*cooling the hydrotreated effluent*," as independent claim 1 recites (emphasis added). In fact, Kelley specifically teaches against the intermediate cooling step by emphasizing that "total effluent from hydrofiner 10 is transferred to hydrocracker 12 via line 14, *without intervening cooling*, condensation or separation of ammonia and hydrogen sulfide generated in the hydrofiner." (Col. 4, lines 26-30; emphasis added).

The Examiner's position that "an intervening cooling step *can* be applied" in Kelley's process (September 4, 2003 Advisory Action at 2; October 28, 2003 Advisory Action at 2; emphasis added) misses the point. The issue is not whether cooling *can* be conducted (of course it *can* be conducted – that is Appellants' invention) but rather

whether Kelley suggests the step of cooling. The statutory standard of 35 U.S.C. § 103 is whether the invention as a whole would have been obvious to one skilled in the art, not whether it would have been obvious to one skilled in the art to try various combinations. Richdel Division of Garden America Corp. v. Aqua-Trol Corp., 681 F. Supp. 141, 145 (E.D.N.Y. 1988) ("Obviousness must be established by consideration of the prior art, as well as the claimed invention, as a whole. The reference must do more than suggest that an innovation 'ought to be tried,' or is obvious in hindsight; it must itself directly suggest the desirability of a new combination.").

Thus, whether an intervening cooling step *could* have been applied in Kelley subsequent to contacting a feed stock with hydrogen is not determinative of patentability. As in Richdel Division, Kelley must directly suggest the desirability of conducting a cooling step subsequent to contacting a feed stock with hydrogen, and Kelley fails to do that. As noted above, Kelley teaches, in fact, against this intermediate cooling step by noting that "total effluent from hydrofiner 10 is transferred to hydrocracker 12 via line 14, *without intervening cooling*, condensation or separation of ammonia and hydrogen sulfide generated in the hydrofiner." (Col. 4, lines 26-30; emphasis added).

Kelley is also silent about a temperature in the step of "contacting the cooled hydrotreated effluent with a hydrotreating catalyst" that is "between 50°C and 150°C lower than outlet temperature from step (a)," as dependent claim 2 recites. Kelley could not teach such range of temperature simply because Kelley teaches against cooling of the effluent. For at least these reasons, the Examiner fails to establish a *prima facie* case of obviousness and reversal of the rejection of claim 2 is respectfully requested.

C. CLAIM 4 IS PATENTABLE OVER KELLEY ET AL. (U.S. PATENT NO. 4,040,944) IN VIEW OF INWOOD (U.S. PATENT NO. 3,691,060)

As noted above, independent claim 1 recites a "process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock" by *inter alia* "contacting the feed stock with hydrogen over a hydrotreating catalyst at conditions

being effective for hydrotreating and obtaining a hydrotreated effluent" and "cooling the hydrotreated effluent." Independent claim 1 also recites "contacting the cooled hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds" and "introducing the hydrotreated effluent from step (c) into an FCC unit for producing gasoline." Claim 4 depends on independent claim 1 and recites that the step of "contacting the hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds" is "performed in a final catalyst bed of the hydrotreating zone."

Inwood relates to a method of "hydrogenation of aromatic hydrocarbons." (Abstract; Title). Inwood teaches that "[a]romatic hydrocarbon feedstock containing organic sulfur compounds are hydrogenated in a 'single-stage' process, utilizing a dual-catalyst hydrogenation system." (Abstract). In this manner, "[t]he feed is first hydrofined over a sulfactive catalyst . . . and total effluent is then hydrogenated over a sulfur-sensitive Group VIII noble metal hydrogenation catalyst." (Abstract).

The subject matter of dependent claim 4 would not have been obvious over Kelley in view of Inwood. First, Kelley and Inwood, whether considered alone or in combination, fail to teach or suggest all limitations of independent claim 1. As noted above, Kelley fails to teach or suggest "*cooling the hydrotreated effluent*" subsequent to "contacting the feed stock with hydrogen . . . for hydrotreating and obtaining a hydrotreated effluent" but before "contacting the cooled hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds," as independent claim 1 recites (emphasis added).

Similarly, Inwood fails to teach or suggest the sequence of steps recited in independent claim 1. Inwood does not teach or suggest "contacting the feed stock with hydrogen over a hydrotreating catalyst . . . and obtaining a hydrotreated effluent," "cooling the hydrotreated effluent," "contacting the cooled hydrotreated effluent with a

hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds" and "introducing the hydrotreated effluent from step (c) into an FCC unit for producing gasoline," as independent claim 1 recites. Inwood teaches that the first step requires "hydrofining conditions and catalysts" and that the second step requires "hydrogenation conditions and catalysts," without an intermediary cooling step. (Col. 3, lines 33-75; Col. 4, lines 1-20).

Second, to establish a *prima facie* case of obviousness, "[i]t is insufficient that the prior art disclosed the components of the patented device, either separately or used in other combinations; there must be some teaching, suggestion, or incentive to make the combination made by the inventor." Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 934 (Fed. Cir. 1990). This way, "the inquiry is not whether each element existed in the prior art, but whether the prior art made obvious the invention as a whole for which patentability is claimed." Hartness Int'l, Inc. v. Simplimatic Engineering Co., 819 F.2d 1100, 1108 (Fed. Cir. 1987). Accordingly, a determination of obviousness "must involve more than indiscriminately combining prior art; a motivation or suggestion to combine must exist." Pro-Mold & Tool Co., 75 F.3d at 1573. This way, a rejection of a claim for obviousness in view of a combination of prior art references must be based on a showing of a suggestion, teaching, or motivation that has to be "clear and particular." In re Dembiczak, 175 F.3d at 999, 50 U.S.P.Q.2d at 1617. Thus, the mere fact that it is possible to find two isolated disclosures which might be combined to produce a new compound does not necessarily render such production obvious, unless the prior art also suggests the desirability of the proposed combination.

The April 18, 2003 Office Action failed to establish a *prima facie* case of obviousness because, as the Court in Northern Telecom, Inc. noted, "[i]t is insufficient that the prior art disclosed the components of the patented device" and there is no "teaching, suggestion, or incentive to make the combination." Northern Telecom, Inc., 908 F.2d at 934. On one hand, Kelley relates to a *dual-step process* of subjecting a raw feedstock boiling predominantly above 600° F and containing a material boiling above

800° F to catalytic hydrofining followed by catalytic hydrocracking at high pressures. On the other hand, Inwood teaches a *"single-stage" process* "utilizing a dual-catalyst hydrogenation system." (Abstract; emphasis added). In fact, in the background section, Inwood clearly emphasizes the drawbacks of the "two-stage systems" and points out the advantages of a "dual-catalyst, single-stage system." (Col. 2, lines 4-67). Accordingly, a person of ordinary skill in the art would not have been motivated to combine Kelley, which teaches a dual-step process for feedstock treatment, with Inwood, which teaches against the use of a dual-step process. For at least the reasons above, the Examiner failed to establish a *prima facie* case of obviousness and reversal of the rejection of claim 4 is respectfully requested.

IX. CONCLUSION

In conclusion, Appellants respectfully submit that the final rejection of claims 1-8 is in error for at least the reasons outlined above. Reversal of the final rejection of claims 1-8 is requested.

Dated: November 6, 2003

Respectfully submitted,

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CLAIMS INVOLVED IN THE APPEAL

A copy of the claims involved in the present appeal is attached below as Appendix A.

APPENDIX A

1. A process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock having a boiling range between 200°C and 600°C, which process comprises the steps of:

(a) contacting the feed stock with hydrogen over a hydrotreating catalyst in a hydrotreating zone at conditions being effective for hydrotreating and obtaining a hydrotreated effluent comprising hydrotreated feed stock, hydrogen sulphide and hydrogen;

(b) cooling the hydrotreated effluent;

(c) contacting the cooled hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds; and

(d) introducing the hydrotreated effluent from step (c) into an FCC unit for producing gasoline.

2. A process of claim 1, wherein the temperature in step (c) is between 50°C and 150°C lower than outlet temperature from step (a).

3. A process of claim 1, wherein LHSV in step (c) is between 2 and 20 times the LHSV in step (a).

4. A process of claim 1, wherein step (c) is performed in a final catalyst bed of the hydrotreating zone.

5. A process of claim 1, wherein the feedstock is characterized by having a 50% boiling point between 300°C and 450°C.

6. A process of claim 1, wherein the hydrotreating catalyst used in step (c) is a composite of Group VI-B and/or Group VIII metal on a porous refractory inorganic oxide.

7. A process of claim 6, wherein the metals are nickel and molybdenum or nickel and tungsten.

8. A process of claim 6, wherein the porous refractory inorganic oxide is alumina or silica-alumina.

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Commissioner for Patents
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II. RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences known to Appellants, their legal representative, or the assignee that will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

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V. SUMMARY OF INVENTION

The present invention relates to a process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock. A feed stock is mixed with hydrogen and passed through a hydrotreating reactor over a hydrotreating

catalyst under conditions that are effective for hydrotreating and obtaining a hydrotreated effluent. The effluent from the hydrotreating reactor is cooled to a suitable temperature by heat exchange with the feed. The cooled hydrotreated effluent is subsequently contacted with a hydrotreating catalyst at conditions that are effective for the hydrogenation of the polyaromatic hydrocarbons and, therefore, for the conversion of the polyaromatic hydrocarbons to monoaromatic compounds. The hydrotreated effluent including the monoaromatic compounds is then introduced into a fuel catalytic cracking (FCC) unit for producing gasoline.

VI. ISSUES

Whether the rejection of claims 1, 3 and 5-8 as being anticipated by Kelley et al. (U.S. Patent No. 4,040,944) should be reversed.

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VIII. ARGUMENTS

A. CLAIMS 1, 3 AND 5-8 ARE NOT PROPERLY REJECTED UNDER 35 U.S.C. § 102 AS BEING ANTICIPATED BY KELLEY ET AL. (U.S. PATENT N0. 4,040,944)

Claims 1, 3 and 5-8 are rejected under 35 U.S.C. § 102 as being anticipated by Kelley et al. (U.S. Patent No. 4,040,944) ("Kelley"). This rejection is respectfully traversed.

Independent claim 1 recites a "process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock" by *inter alia* "contacting the feed stock with hydrogen over a hydrotreating catalyst at conditions being effective for hydrotreating and obtaining a hydrotreated effluent" and "cooling the hydrotreated effluent." Independent claim 1 also recites "contacting the cooled hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds" and "introducing the hydrotreated effluent from step (c) into an FCC unit for producing gasoline."

Dependent claim 3 recites that the "LHSV in step (c) is between 2 and 20 times the LHSV in step (a)." Dependent claim 5 recites that "the feedstock is characterized by having a 50% boiling point between 300°C and 450°C." Dependent claim 6 recites that "the hydrotreating catalyst used in step (c) is a composite of Group VI-B and/or Group VIII metal on a porous refractory inorganic oxide." Claims 7 and 8 dependent on claim 6 and recite that "the metals are nickel and molybdenum or nickel and tungsten" and that "the porous refractory inorganic oxide is alumina or silica-alumina," respectively.

Kelley relates to a method of manufacturing catalytic cracking charge stocks by hydrocracking. According to Kelley, charge stock containing a relatively large proportion of heavy hydrocarbons boiling above about 800° F is produced by first subjecting a raw feedstock boiling predominantly above 600° F and containing a substantial proportion of material boiling above 800° F to catalytic hydrofining followed by catalytic hydrocracking at high pressures. (Abstract). Kelley teaches that the hydrocracking catalyst and conditions

"are chosen so as to achieve selective conversion of material boiling between about 600° F and 800° F to lower boiling materials with a relatively minor conversion of the 800° F + material." (Abstract). In this manner, "[t]he resulting product boiling above 400° F is rich in 800° F + material, and constitutes an excellent catalytic cracking charge stock." (Abstract).

Kelley does not disclose all limitations of claims 1, 3 and 5-8. Kelley fails to teach or suggest a "process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock" by *inter alia* "contacting the feed stock with hydrogen over a hydrotreating catalyst at conditions being effective for hydrotreating and obtaining a hydrotreated effluent" and "*cooling the hydrotreated effluent*," as independent claim 1 recites (emphasis added). Kelley teaches a dual-step process of subjecting a raw feedstock boiling predominantly above 600° F and containing a material boiling above 800° F to catalytic hydrofining followed by catalytic hydrocracking at high pressures. Kelley is silent, however, about "*cooling the hydrotreated effluent*" subsequent to "contacting the feed stock with hydrogen . . . for hydrotreating and obtaining a hydrotreated effluent" and before "contacting the cooled hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds," as independent claim 1 recites (emphasis added).

Appellants disagree with the Examiner's position that the statement in Kelley that the hydrocracker is "operated at substantially reduced temperatures" meets the steps of "cooling the hydrotreated effluent" and "contacting the cooled hydrotreated effluent with a hydrotreating catalyst" of the claimed invention. First, the term "operated at substantially reduced temperatures" simply denotes that the hydrocracker 12 may be operated at lower temperatures, as part of the "[m]any variations in the . . . processing scheme" contemplated by Kelley. (Col. 6, lines 25-36). The term "operated at substantially reduced temperatures" of Kelley does not disclose or suggest the active steps of "cooling the hydrotreated effluent" and "contacting the cooled hydrotreated effluent

with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds," as specifically recited in independent claim 1 of the present application. In Kelley, there is no mention about "cooling the hydrotreated effluent," much less about "contacting the *cooled* hydrotreated effluent with a hydrotreating catalyst," as in the claimed invention (emphasis added).

Second, Kelley specifically teaches against the intermediate cooling step. Kelley emphasizes that "total effluent from hydrofiner 10 is transferred to hydrocracker 12 via line 14, *without intervening cooling*, condensation or separation of ammonia and hydrogen sulfide generated in the hydrofiner." (Col. 4, lines 26-30; emphasis added). In fact, in exemplifying the first step of manufacturing its catalytic cracking charge stocks, Kelley lists both the temperatures of the hydrofining and hydrocracking steps as constant, that is, a "broad range" of 650-875°F and a "preferred range" of 725-850°F. (Col. 4, lines 8-10; lines 38-40). Thus, it is clear that no intervening cooling step occurs between the hydrofining and hydrocracking steps of Kelley.

Third, the Examiner's assertion that "[o]ne of ordinary skill in the art reading these two sections [of Kelley] would realize that an intervening cooling step can be applied" is wrong.[1] (August 1, 2003 Advisory Action at 2; October 28, 2003 Advisory Action at 2). As noted above, Kelley teaches a constant temperature range of 650-875°F for its hydrofining and hydrocracking steps. This is because, in outlining the problems of the prior art non-hydrogenative catalytic cracking systems, Kelley specifically notes that

[1] In the Advisory Actions dated September 4, 2003 and October 28, 2003, the Examiner notes that "Kelly discloses that the process can be operated without intervening cooling, condensation, or separation of ammonia and hydrogen sulfide." (September 4, 2003 Advisory Action at 2; October 28, 2003 Advisory Action at 2). The Examiner also asserts that "Kelley also discloses that an intervening treatment of the hydrofiner effluent can be performed to remove ammonia and hydrogen sulfide." (September 4, 2003 Advisory Action at 2; October 28, 2003 Advisory Action at 2). The Examiner then concludes that "[o]ne of ordinary skill in the art reading these two sections would realize that an intervening cooling step can be applied" and that "the disclosure that the hydrocracker can be operated at substantially reduced temperatures indicates that cooling can be

"[i]f a feedstock boils over a wide range of say 400° to 1000°F, it is difficult to select a cracking temperature which is optimum for all hydrocarbon fractions in the feed." (Col. 1, lines 24-27). For example, "[i]f high cracking temperatures are utilized in order to maintain adequate conversion of the lower boiling fractions, the higher boiling fractions then tend to produce inordinate amounts of coke and light gases." (Col. 1, lines 27-31). Similarly, "if low temperatures are employed . . . then conversion of the lower boiling fractions is reduced, resulting in low overall conversions per pass and high recycle rates." (Col. 1, lines 31-35). Accordingly, one skilled in the art would not have been motivated to modify the temperature of the hydrocracker of Kelley or to operate the hydrocracker of Kelley at substantially lower temperatures, as the Examiner asserts.

Appellants note that courts have repeatedly emphasized that anticipation is established only if (1) all the elements of an invention as stated in a patent claim (2) are identically set forth (3) in a single prior art reference.[2] Thus, the standard for anticipation or lack of novelty is strict identity. See, e.g., Novo Nordisk A/S v. Becton Dickinson & Co., 96 F. Supp. 2d 309, 312 (S.D.N.Y. 2000) ("It is not sufficient that each element be found somewhere in the reference, the elements must be 'arranged as in the claim.' *Lindemann Maschinenfabrik GMBH v. American Hoist and Derrick Co.*, 703 F.2d 1452, 1458 (Fed. Cir. 1984). Further, the reference must be sufficiently clear so as to prove the existence of each and every element in the reference."); Verve, LLC v. Crane Cams, Inc., 311 F.3d 1116, 1120 (Fed. Cir. 2002) ("A single reference must describe the claimed invention with sufficient precision and detail to establish that the subject matter existed in

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performed." (September 4, 2003 Advisory Action at 2; October 28, 2003 Advisory Action at 2).

[2] See, e.g., Gechter v. Davidson, 116 F.3d 1454, 1457 (Fed. Cir. 1997) ("Under 35 U.S.C. § 102, every limitation of a claim must identically appear in a single prior art reference for it to anticipate the claim."); Glaverbel Societe Anonyme v. Northlake Marketing & Supply, Inc., 45 F.3d 1550, 1554 (Fed. Cir. 1995) ("Anticipation requires identity of the claimed process and a process of the prior art; the claimed process, including each step thereof, must have been described or embodied, either expressly or inherently, in a single reference."; "Anticipation . . . requires identity of invention: the claimed invention, as described in appropriately construed claims, must be the same as that of the reference, in order to anticipate.").

the prior art."); C.R. Bard, Inc. v. M3 Systems, Inc., 157 F.3d 1340, 1349 (Fed. Cir. 1998), *rehearing denied & suggestion for rehearing in banc declined*, 161 F.3d 1380 (Fed. Cir. 1998), *cert denied*, 526 U.S. 1130 (1999) ("When the defense of lack of novelty is based on a printed publication that is asserted to describe the same invention, a finding of anticipation requires that the publication describe all of the elements of the claims, arranged as in the patented device."); Hazani v. U.S. Int'l Trade Comm'n, 126 F.3d 1473, 1477 (Fed. Cir. 1997) ("To anticipate a claim, a prior art reference must disclose every feature of the claimed invention, either explicitly or inherently.").

In the present case, and as the case law requires, Kelley must disclose every feature of the claimed invention. Kelley, however, does not disclose or suggest the active step of "cooling the hydrotreated effluent," as specifically recited in independent claim 1 of the present application. The term "operated at substantially reduced temperatures" of Kelley simply denotes that the hydrocracker 12 may be operated at lower temperatures, as part of the "[m]any variations in the . . . processing scheme" contemplated by Kelley (Kelley at col. 6, lines 25-36); the term "operated at substantially reduced temperatures" of Kelley does not disclose or suggest the active step of "cooling the hydrotreated effluent," as in the claimed invention. Accordingly, Kelley fails to disclose all process steps of claims 1, 3 and 5-8, arranged in the recited order, and reversal of the rejection of claims 1, 3 and 5-8 is respectfully requested.

B. CLAIM 2 IS PATENTABLE OVER KELLEY ET AL. (U.S. PATENT NO. 4,040,944)

As noted above, independent claim 1 recites a "process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock" by *inter alia* "contacting the feed stock with hydrogen over a hydrotreating catalyst at conditions being effective for hydrotreating and obtaining a hydrotreated effluent" and "cooling the hydrotreated effluent." Independent claim 1 also recites "contacting the cooled hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds" and "introducing

the hydrotreated effluent from step (c) into an FCC unit for producing gasoline." Claim 2 depends on independent claim 1 and recites that "the temperature in step (c) is between 50°C and 150°C lower than outlet temperature from step (a)."

Kelley does not teach or suggest all limitations of dependent claim 2. Specifically, the Examiner fails to establish a *prima facie* case of obviousness. Appellants note that courts have generally recognized that a showing of a *prima facie* case of obviousness necessitates three requirements: (i) some suggestion or motivation, either in the references themselves or in the knowledge of a person of ordinary skill in the art, to modify the reference or combine the reference teachings; (ii) a reasonable expectation of success; and (iii) the prior art references must teach or suggest all claim limitations. See e.g., In re Dembiczak, 175 F.3d 994 (Fed. Cir. 1999); In re Rouffet, 149 F.3d 1350, 1355 (Fed. Cir. 1998); Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc., 75 F.3d 1568, 1573 (Fed. Cir. 1996).

In the present case, Kelley fails to teach or suggest all limitations of independent claim 1 and of dependent claim 2. As noted above, Kelley fails to teach or suggest a "process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock" by *inter alia* "contacting the feed stock with hydrogen over a hydrotreating catalyst at conditions being effective for hydrotreating and obtaining a hydrotreated effluent" and "*cooling the hydrotreated effluent*," as independent claim 1 recites (emphasis added). In fact, Kelley specifically teaches against the intermediate cooling step by emphasizing that "total effluent from hydrofiner 10 is transferred to hydrocracker 12 via line 14, *without intervening cooling*, condensation or separation of ammonia and hydrogen sulfide generated in the hydrofiner." (Col. 4, lines 26-30; emphasis added).

The Examiner's position that "an intervening cooling step *can* be applied" in Kelley's process (September 4, 2003 Advisory Action at 2; October 28, 2003 Advisory Action at 2; emphasis added) misses the point. The issue is not whether cooling *can* be conducted (of course it *can* be conducted – that is Appellants' invention) but rather

whether Kelley suggests the step of cooling. The statutory standard of 35 U.S.C. § 103 is whether the invention as a whole would have been obvious to one skilled in the art, not whether it would have been obvious to one skilled in the art to try various combinations. Richdel Division of Garden America Corp. v. Aqua-Trol Corp., 681 F. Supp. 141, 145 (E.D.N.Y. 1988) ("Obviousness must be established by consideration of the prior art, as well as the claimed invention, as a whole. The reference must do more than suggest that an innovation 'ought to be tried,' or is obvious in hindsight; it must itself directly suggest the desirability of a new combination.").

Thus, whether an intervening cooling step *could* have been applied in Kelley subsequent to contacting a feed stock with hydrogen is not determinative of patentability. As in Richdel Division, Kelley must directly suggest the desirability of conducting a cooling step subsequent to contacting a feed stock with hydrogen, and Kelley fails to do that. As noted above, Kelley teaches, in fact, against this intermediate cooling step by noting that "total effluent from hydrofiner 10 is transferred to hydrocracker 12 via line 14, *without intervening cooling*, condensation or separation of ammonia and hydrogen sulfide generated in the hydrofiner." (Col. 4, lines 26-30; emphasis added).

Kelley is also silent about a temperature in the step of "contacting the cooled hydrotreated effluent with a hydrotreating catalyst" that is "between 50°C and 150°C lower than outlet temperature from step (a)," as dependent claim 2 recites. Kelley could not teach such range of temperature simply because Kelley teaches against cooling of the effluent. For at least these reasons, the Examiner fails to establish a *prima facie* case of obviousness and reversal of the rejection of claim 2 is respectfully requested.

C. CLAIM 4 IS PATENTABLE OVER KELLEY ET AL. (U.S. PATENT NO. 4,040,944) IN VIEW OF INWOOD (U.S. PATENT NO. 3,691,060)

As noted above, independent claim 1 recites a "process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock" by *inter alia* "contacting the feed stock with hydrogen over a hydrotreating catalyst at conditions

being effective for hydrotreating and obtaining a hydrotreated effluent" and "cooling the hydrotreated effluent." Independent claim 1 also recites "contacting the cooled hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds" and "introducing the hydrotreated effluent from step (c) into an FCC unit for producing gasoline." Claim 4 depends on independent claim 1 and recites that the step of "contacting the hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds" is "performed in a final catalyst bed of the hydrotreating zone."

Inwood relates to a method of "hydrogenation of aromatic hydrocarbons." (Abstract; Title). Inwood teaches that "[a]romatic hydrocarbon feedstock containing organic sulfur compounds are hydrogenated in a 'single-stage' process, utilizing a dual-catalyst hydrogenation system." (Abstract). In this manner, "[t]he feed is first hydrofined over a sulfactive catalyst . . . and total effluent is then hydrogenated over a sulfur-sensitive Group VIII noble metal hydrogenation catalyst." (Abstract).

The subject matter of dependent claim 4 would not have been obvious over Kelley in view of Inwood. First, Kelley and Inwood, whether considered alone or in combination, fail to teach or suggest all limitations of independent claim 1. As noted above, Kelley fails to teach or suggest "*cooling the hydrotreated effluent*" subsequent to "contacting the feed stock with hydrogen . . . for hydrotreating and obtaining a hydrotreated effluent" but before "contacting the cooled hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds," as independent claim 1 recites (emphasis added).

Similarly, Inwood fails to teach or suggest the sequence of steps recited in independent claim 1. Inwood does not teach or suggest "contacting the feed stock with hydrogen over a hydrotreating catalyst . . . and obtaining a hydrotreated effluent," "cooling the hydrotreated effluent," "contacting the cooled hydrotreated effluent with a

hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds" and "introducing the hydrotreated effluent from step (c) into an FCC unit for producing gasoline," as independent claim 1 recites. Inwood teaches that the first step requires "hydrofining conditions and catalysts" and that the second step requires "hydrogenation conditions and catalysts," without an intermediary cooling step. (Col. 3, lines 33-75; Col. 4, lines 1-20).

Second, to establish a *prima facie* case of obviousness, "[i]t is insufficient that the prior art disclosed the components of the patented device, either separately or used in other combinations; there must be some teaching, suggestion, or incentive to make the combination made by the inventor." Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 934 (Fed. Cir. 1990). This way, "the inquiry is not whether each element existed in the prior art, but whether the prior art made obvious the invention as a whole for which patentability is claimed." Hartness Int'l, Inc. v. Simplimatic Engineering Co., 819 F.2d 1100, 1108 (Fed. Cir. 1987). Accordingly, a determination of obviousness "must involve more than indiscriminately combining prior art; a motivation or suggestion to combine must exist." Pro-Mold & Tool Co., 75 F.3d at 1573. This way, a rejection of a claim for obviousness in view of a combination of prior art references must be based on a showing of a suggestion, teaching, or motivation that has to be "clear and particular." In re Dembiczak, 175 F.3d at 999, 50 U.S.P.Q.2d at 1617. Thus, the mere fact that it is possible to find two isolated disclosures which might be combined to produce a new compound does not necessarily render such production obvious, unless the prior art also suggests the desirability of the proposed combination.

The April 18, 2003 Office Action failed to establish a *prima facie* case of obviousness because, as the Court in Northern Telecom, Inc. noted, "[i]t is insufficient that the prior art disclosed the components of the patented device" and there is no "teaching, suggestion, or incentive to make the combination." Northern Telecom, Inc., 908 F.2d at 934. On one hand, Kelley relates to a *dual-step process* of subjecting a raw feedstock boiling predominantly above 600° F and containing a material boiling above

800° F to catalytic hydrofining followed by catalytic hydrocracking at high pressures. On the other hand, Inwood teaches a *"single-stage" process* "utilizing a dual-catalyst hydrogenation system." (Abstract; emphasis added). In fact, in the background section, Inwood clearly emphasizes the drawbacks of the "two-stage systems" and points out the advantages of a "dual-catalyst, single-stage system." (Col. 2, lines 4-67). Accordingly, a person of ordinary skill in the art would not have been motivated to combine Kelley, which teaches a dual-step process for feedstock treatment, with Inwood, which teaches against the use of a dual-step process. For at least the reasons above, the Examiner failed to establish a *prima facie* case of obviousness and reversal of the rejection of claim 4 is respectfully requested.

IX. CONCLUSION

In conclusion, Appellants respectfully submit that the final rejection of claims 1-8 is in error for at least the reasons outlined above. Reversal of the final rejection of claims 1-8 is requested.

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Respectfully submitted,

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CLAIMS INVOLVED IN THE APPEAL

A copy of the claims involved in the present appeal is attached below as Appendix A.

APPENDIX A

1. A process for reducing content of sulphur compounds and polyaromatic hydrocarbons in a hydrocarbon feed stock having a boiling range between 200°C and 600°C, which process comprises the steps of:

(a) contacting the feed stock with hydrogen over a hydrotreating catalyst in a hydrotreating zone at conditions being effective for hydrotreating and obtaining a hydrotreated effluent comprising hydrotreated feed stock, hydrogen sulphide and hydrogen;

(b) cooling the hydrotreated effluent;

(c) contacting the cooled hydrotreated effluent with a hydrotreating catalyst at conditions being effective for conversion of polyaromatic hydrocarbons to monoaromatic compounds; and

(d) introducing the hydrotreated effluent from step (c) into an FCC unit for producing gasoline.

2. A process of claim 1, wherein the temperature in step (c) is between 50°C and 150°C lower than outlet temperature from step (a).

3. A process of claim 1, wherein LHSV in step (c) is between 2 and 20 times the LHSV in step (a).

4. A process of claim 1, wherein step (c) is performed in a final catalyst bed of the hydrotreating zone.

5. A process of claim 1, wherein the feedstock is characterized by having a 50% boiling point between 300°C and 450°C.

6. A process of claim 1, wherein the hydrotreating catalyst used in step (c) is a composite of Group VI-B and/or Group VIII metal on a porous refractory inorganic oxide.

7. A process of claim 6, wherein the metals are nickel and molybdenum or nickel and tungsten.

8. A process of claim 6, wherein the porous refractory inorganic oxide is alumina or silica-alumina.